ABSTRACT

METHODS, SYSTEMS AND COMPOSITIONS FOR FIRE RETARDING SUBSTRATES

The present invention relates to "closed loop" processes, systems and compositions for providing one or more flame retardant properties to, or for enhancing one or more flame retardant properties of, substrates containing at least about 5 weight percent of non-thermoplastic material, such as non-thermoplastic filaments, microfibers, fibers, fibrous compositions, threads, yarns, fabrics, textiles, materials, items of apparel, paper, tissue and/or blends, or to one or more products produced using any of the foregoing materials, and to substrates treated in accordance with the processes, systems and/or compositions of the invention.

The processes and systems of the invention are "environmentally friendly," and advantageously conserve chemical compounds, water and/or other process components, thereby significantly reducing costs that would generally otherwise be incurred using flame retarding processes and systems (costs of chemical compounds, water and other process components, waste treatment costs, waste disposal costs and/or the like).

The processes of the invention generally comprise: (a) applying a flame retardant composition containing one or more flame retardant substances, an aqueous liquid, one or more adhesion agents and, optionally, one or more stability enhancing agents, one or more viscosity enhancing agents and/or one or more wetting agents to one or more substrates in an amount that is sufficient to provide one or more flame retardant properties to the substrates, or to enhance one or more flame retardant properties of the substrates; (b) removing excess flame retardant composition from the one or more substrates; (c) permitting the one or more substrates to dry for a period of time, and at a temperature, that permits the substrates to have a low moisture content; and (d) applying the excess flame retardant composition that is removed from the one or more substrates to the one or more substrates at least one additional time, prior to, during or after the one or more substrates are permitted to dry, or to one or more other substrates of the same or different type, in an amount that is sufficient to provide one or more flame retardant properties to the substrates, or to enhance one or more flame

retardant properties of the substrates; wherein the flame retardant composition does not contain an amount of a dye or other agent that could contaminate the flame retardant composition.

A preferred "closed loop" system of the invention is shown in FIG. 1.

5